The Armed Forces Casualty Assistance Readiness Enhancement System (AF-CARES) Version 1.0

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Executive Summary

This report provides details of the implementation of a forms assistance tool designed to help personnel charged with carrying out the United States Army's Casualty Assistance mission. The need for this tool has arisen with the expansion of casualty operations in the Global War on Terror (GWOT), the growing complexity of the system of benefits provided to the surviving family members of soldiers who are killed, and the high level of emphasis placed on executing this mission with compassion and precision.

The software tool, called the Armed Forces Casualty Readiness Enhancement System (AF-CARES 1.0), provides form filling assistance and access to case data in a stand alone application. The system uses a run time data representation of the case and an extensible markup language specification for the library of supported forms to automate the routing tasks common to every case of filling out a significant number of forms. The software automatically fills forms and provides access to the forms for viewing, printing, and editing. The software also provides a persistent save file format and case file reader for managing cases over time.

AF-CARES 1.0 has been deployed to all of the regional Casualty Assistance Centers (CACs) with 76 users participating in an Army Knowledge Online (AKO) knowledge center implemented to facilitate deployment, support, and the identification of capability gaps against an objective software assistance capability.

About the Author

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Acknowledgements

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Acronyms

AF-CARES	Armed Forces Casualty Assistance Readiness Enhancement System
API	Application Programmer Interface
AR	Army Regulation
CAC	Casualty Assistance Center
CAO	Casualty Assistance Officer
CMAOC	Casualty and Mortuary Affairs Operations Center
DA	Department of the Army
DCIPS	Defense Casualty Information Processing System
DoD	Department of Defense
DOIM	Directorate of Information Management
GWOT	Global War on Terror
HRC	Human Resources Command
IAW	In Accordance With
NOK	Next of Kin
ODBC	Open Database Connectivity
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
OO	Object Oriented
ORCEN	Operations Research Center of Excelence
PADD	Person Authorized to Direct Disposition
PDF	Portable Document Format
PDF4NET	Portable Document Format for Microsoft .Net Framework
PERE	Person Eligible to Receive Effects
PNOK	Primary Next of Kin
SF	Standard Form
SNOK	Secondary Next of Kin
UI	User Interface
VA	Veterans Administration
XFDL	Extensible Forms Description Language
XML	Extensible Markup Language

Chapter 1. Introduction

The United States Army manages casualty operations from the Casualty and Mortuary Affairs Operations Center (CMAOC) at the United States Army Human Resources Command (HRC) in Alexandria, Virginia. The mission of the CMAOC is "to assist Army families in an emotionally stressful time of bereavement"[1]. This mission is given a high level of command emphasis by the senior leadership of the Army. It is executed by individual Causality Assistance Officers (CAOs) through the system of 35 regional Casualty Assistance Centers (CACs) shown in the Table 1.

Table 1: Casualty Assistance Centers.[2]

Ft. Belvoir, VA	Ft. Benning, GA	Ft. Bliss, TX
Ft. Bragg, NC	Ft. Campbell, KY	Ft. Carson, CO
Ft. Dix, NJ	Ft. Drum, NY	Ft. Eustis, VA
Germany - 1st PERSCOM	Ft. Gordon, GA	Ft. Hood, TX
Ft. Huachuca, AZ	Ft. Jackson, SC	Japan - Okinawa
Japan - Zama	Ft. Knox, KY	Korea - 8th PERSCOM
Ft. Leavenworth, KS	Ft. Lee, VA	Ft. Leonard Wood, MO
Ft. Lewis, WA	Ft. McPherson, GA	Ft. Meade, MD
Ft. Myer, VA	Ft. Polk, LA	Puerto Rico - Ft. Buchanan
Ft. Richardson, AK	Ft. Riley, KS	Ft. Rucker, AL
Ft. Sam Houston, TX	Ft. Schofield, HI	Ft. Sill, OK
Ft. Stewart, GA	West Point, NY	

The CAO is the personal representative of the Secretary of the Army to the family of the deceased service member[3].

The casualty assistance system has expanded rapidly with the Army's mobilization for the Global War on Terror (GWOT). The number of Army deaths in Operations Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) as of 23 December 2006 is 2260[4]. The casualties from the GWOT have approximately doubled the number of soldiers who die on active duty from the rate that we observed throughout the 1990s. In addition to a higher overall load on the system, the war has seen an expansion to the benefits and information routinely made available to the families of service members who die on active duty. Policy on casualty assistance has also evolved as a consequence of the perception that the public demands a very high level of emphasis on casualty assistance and a high level of support to the families of fallen soldiers.

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[1] https://www.hrc.army.mil/site/Active/TAGD/CMAOC/cmaoc.htm
[2] https://www.hrc.army.mil/site/Active/TAGD/CMAOC/CACLOCATOR/CACLOCATORINDEX.htm
[3] Army Regulation 600-8-1
[4] DoD Personnel and Military Casualty Statistics:
    http://siadapp.dior.whs.mil/personnel/MMIDHOME.HTM

Complexity in casualty case management arises from several sources. The first is the inherent complexity of administering a program that crosses agency boundaries and provides assistance and benefits under several distinct regulations and laws. A second source of complexity in the system arises from the uniqueness of each case. Every service member who is killed has a unique set of family circumstances which require a careful application of the rule set governing assistance and benefits. In the simplest case, a single service member with no dependents has two living parents who are married to each other, and are named as beneficiaries on properly executed and up to date notification and beneficiary forms. Many soldiers who become casualties have more complex family situations including spouses, children, ex-spouses, children from ex-spouses, divorced, or deceased parents and step parents, improper or inaccurate notification and beneficiary data and a host of other unique considerations for which the assistance system must account. The diagnostic tree that can provide a taxonomic representation of every possible case circumstance is quite large. Consider a diagnostic tree that asks the questions in table shown here:

Table 2: Case Diagnostic Tree.

Marital Status	# of Marriages	Children	Parents	Siblings
Single, never married	Married multiple times	No Children	Both parents living and married to each other	No siblings
Currently married	Married once	One or more children from one other partner	Mother deceased	One or more siblings
Divorced		Children from several partners	Father deceased	Half and step siblings
Widowed			Parents Divorced	

Answering the questions in this table from left to right gives rise to a tree structure with 315 different unique circumstances that a particular case can fall under. Even under this diagnostic tree there are several case types that would require further diagnosis. The nature of the case as diagnosed by such a tree is critical to many decisions including:

- Who is the Primary next of kin?
- To whom is the death gratuity paid?
- Who is entitled to specific benefits?
- Who is authorized to be given information about the circumstances of the soldier's death?
- Who is entitled to travel at government expense to funeral services?

Even in the simplest cases, the next of kin is shocked and grieving over the sudden loss of a loved one. The primary next of kin is faced with a series of decisions about benefits, interment, and the disposition of personal effects. The family is entitled, by policy to any unclassified information the Department of the Army is able to obtain about the circumstances surrounding the death of their loved one. This information is provided in the form of accident investigations, chain of command initiated investigations under AR 15-6[5], and reports of medical examinations. Under certain circumstances specific members of the family are authorized to travel at government expense to funeral services. A specific person, named by the soldier is given the responsibility of making decisions about the funeral service and increment. A specific person is responsible for receiving the soldier's personal effects. The CMAOC case managers, CAC personnel, and the CAO work together to make sure the Army has all of the information it needs to make an accurate determination of all of the people who have some legal or regulatory interest in the case.

Finally, the assistance system is executed by soldiers who are assigned and trained for the mission of providing casualty assistance, but who normally have little experience performing this duty, and who are not trained as financial planners legal advisors, or grief counselors. The focus of this effort is on automating routine tasks associated with filling forms and assuring the quality of the information on those forms, so that CACs and CAOs can focus more on the needs of the grieving family members and less on administrative tasks.

Previous Work

A considerable amount of previous work was done as part of this project over the period August 2005 to August 2006 by MAJ Ernie Wong. This work is documented in Operations Research Center (ORCEN) Technical Report DSE-TR-0619[6]. This report gives a thorough explanation of the problem solving process used by the ORCEN when undertaking a project of this type. The most current documentation for this Systems Decision Process is in the text "Decision Making in Systems Engineering and Management"[7]. The Systems Decision Process is a structured approach to problem solving that emphasizes careful problem definition and thorough stakeholder centered needs analysis. A diagram of the process is shown at Figure 1.

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[5] Army Regulation 15-6, 2 October 2006.
[6] ORCEN Technical Report DSE-TR-0619, DTIC# ADA4490018, August 2006.
[7] Parnell, et. al. "Decision Making in Systems Engineering and Management," Wiley, 2007.
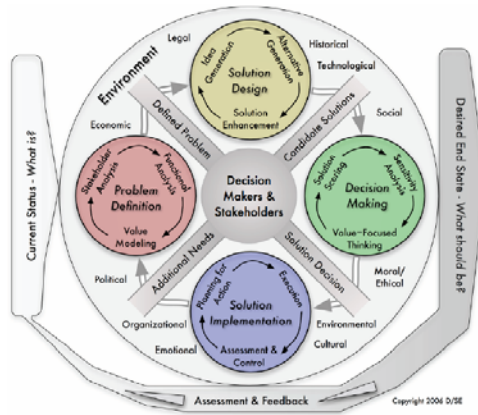
Figure 1: Systems Decision Process.

The process begins with problem definition and proceeds through the design of solution alternatives, the decision to proceed with a particular alternative, and the implementation of the decision. The process is iterative and makes use of feedback and assessment mechanisms to continuously gather information and refine alternatives. At this point in the project we are implementing a software solution that meets some of the identified needs of the system.

A stakeholder analysis for this system was prepared as part of earlier work, along with a functional analysis of the flow of casualty assistance officer duties through the management of a case. This previous work identified areas for improvement in the casualty management system including the need for standardized training and training products and for a software assistance tool for case management. The stakeholders identified in this previous work included:

- Soldiers
- Units
- Families
- The Congress
- The Army Leadership
- The Casualty and Mortuary Affairs Operations Center
- The Regional Casualty Assistance Centers
- Casualty Assistance Officers
- Administrators of the Personnel System
- Administrators of the Defense Casualty Information Processing System
- Other Agencies (e.g. Veteran's Administration, Citizenship and Immigration Service)
- Private Organizations

The work also led to the development of a prototype forms filling assistance tool that demonstrated the capability to receive data from the Defense Casualty Information Processing System (DCIPS) database and use this data to fill electronic forms.

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Deployment

The software developed in this work has been deployed to the regional CACs and is currently being used in an operational test basis. Deploying a new piece of software for use in a mature system like the casualty system presents a unique set of challenges. First, casualty assistance personnel are not necessarily expert computer users. The installation procedure for the software was complicated by the requirement to download, extract and install the software. Computer users operating within Department of Defense (DoD) information technology systems are not generally authorized to install software on their systems. In many cases installation required administrator privileges or a system administrator to physically install the software. Downloading the software was challenging for many users. Initially the software package was posted to the DCIPS web portal. A picture of the DCIPS portal is shown at Figure 2.
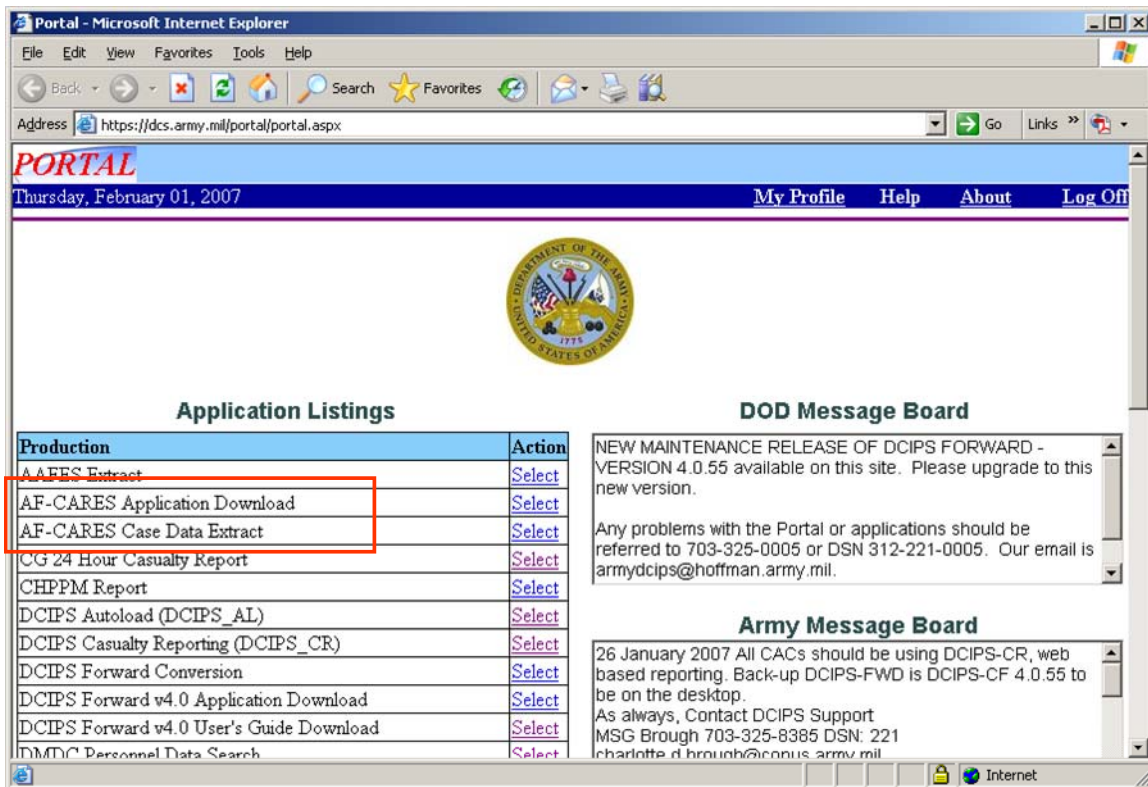
Figure 2: DCIPS Portal.

The second and third functions in the upper left of the portal (under Application Listings) provide for downloading a data query for the case in Microsoft Excel Format and for downloading the application for local installation on a client computer. The view of the portal is not common to every user, and therefore initially not all users could see the option for downloading the software. Software download is now multi-modal, with identical versions of the software posted to the DCIPS portal and to an AKO knowledge center.

In order to facilitate getting the software into the hands of more users, we established an Army Knowledge Online[8] (AKO) Knowledge Center. Participation in this knowledge center grew rapidly to over 70 users. We strongly recommend the continued use of this mechanism for distributing future version of the software and for maintaining a support relationship with users. Appendix B describes the Knowledge Center.

Organization of the Report

This report is a detailed description of the software tool, AF-CARES 1.0, developed to assist with managing forms as a case is worked from the time a soldier becomes a casualty until the case is completed. Chapter 2 is a description of the casualty case management process. Chapter 3 describes the electronic forms formats and database structure. Chapter 4 describes the software including the underlying run time object representation of the case and the user interface. Chapter 5 provides conclusions and recommendations for further work. Appendix A is a set of installation instructions provided with the initial release of the software. Appendix B is a simplified set of instructions developed in response to difficulty with the installation process. Appendix C describes the AKO Knowledge Center.

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[8] https://www.us.army.mil

Chapter 2. The Casualty Case Management Process

The management of an individual casualty case is a complex process that occurs across three basic echelons: the CMAOC, the regional CACs, and the CAOs. The process must ensure cooperation across several agencies within the Department of the Army, and must also provide for cooperation with other agencies of the federal government, state and local governments, and private organizations. The process requires coordination between CAOs working with family members who may be geographically separated from one another. Each case requires a custom application of a basic rule set.

The notification process is carried out separately from the casualty assistance process, but these two critical functions must also we tightly coordinated. Once notification has occurred, the casualty assistance process begins. The casualty assistance process begins with a telephone contact from the CAO to the primary next-of-kin (PNOK) within 4 hours of notification. Assistance is rendered through in-person visits in which information is exchanged, decisions are made, and forms are completed and signed. The major milestones in the process are:

- Initial Contact
- Initial Visit
- Interment
- Disposition of Benefits
- Disposition of Personal Effects
- Disposition of Investigative Reports
- Case After Action Report

These milestones are achieved through a series of personal visits and telephone contacts. The order in which particular milestones are met is unique to each case.
The casualty assistance process is considered complete when a set of conditions are met:

- The disposition and interment of the casualties' remains is complete;
- The disposition of the casualties' personal effects is complete;
- Persons authorized access to all relevant investigative reports into the death have been provided these reports; and
- All benefits have been paid (or payment by allotment initiated) to all beneficiaries.

The integration across the echelons of the casualty assistance system is facilitated by a single database system, DCIPS. DCIPS is maintained at United Stats Army Human Resources Command (HRC) and provides all Department of the Army (DA) agencies involved with case management a common view of the case data.

Phases of the casualty assistance process

Casualty assistance officers complete the case in three Phases. In Phase I, the assistance officer is designated, and reviews and verifies the known information about the case. In accordance with IAW AR 600-8-1, the CAO makes a telephone call to the PNOK within 4 hours of notification unless notification occurs very late in the evening[9]. The CAO coordinates a face to face meeting with the PNOK within 24 hours of notification. This meeting serves as an introduction and as an opportunity to confirm data about the case. Within 72 hours of notification the death gratuity is paid. The CAO also confirms an address for the next of kin that will be valid for 45 days. These actions complete Phase I. Phase II of the assistance process concerns the return and disposition of the soldiers remains. The CAO coordinates specifically with the person authorized to direct disposition (PADD) who is the decision making authority for the place and manner of the funeral and burial of the soldier. This coordination includes decision about funeral benefits and coordination for the return of the remains. These decision can be complicated by several factors including:

- The desires of the PADD
- The availability of military airlift returning the remains from theater
- The condition of the remains
- Authorized travel to the service if the soldier will be interred at a national cemetery
- Authorized transportation of remains by military or contract aircraft.
- Assuring the remains are treated with dignity at each phase of their transportation

This phase occurs during a sensitive and emotional time for the family. Phase II is complete when the soldier is interred.

Phase III of the assistance process concern the payment of benefits and the return of the soldier's personal effects the person eligible to receive effects (PERE). The benefits phase can be complicated by the number of benefit decisions that must be made and documented on an array of forms from several agencies. Phase III is complete, and the case is closed with the payment of all benefits and the submission of the Casualty Assistance Officer After Action Report. After the assistance case is closed, long term support to the next of kin is provided by the family first call center at HRC.

Process Flow

Figure 3 is a diagram of the basic program flow of the CARES System. Not all of the functionality in this process flow is implemented in AF-CARES 1.0.

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[9] Army Regulation 600-8-1, paragraph 6-7.
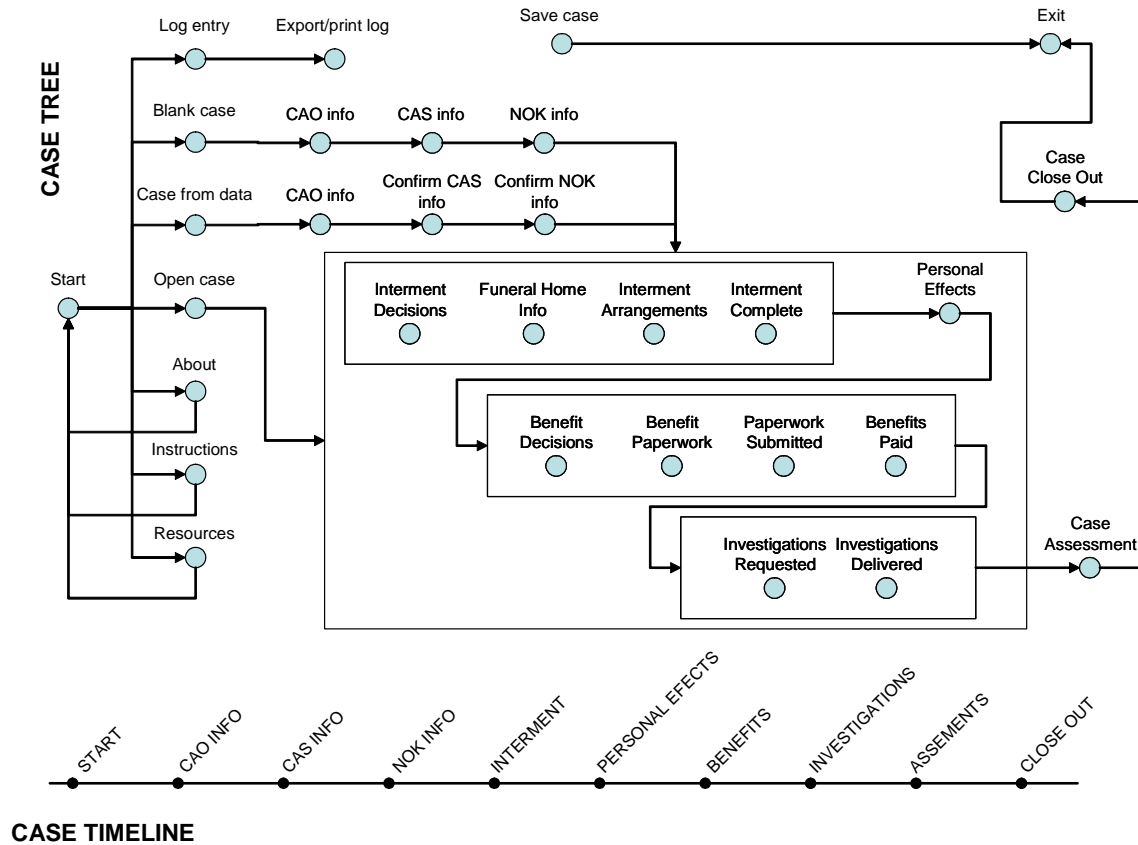
Figure 3: Casualty Process Flow and Case Timeline.

The case timeline in Figure 3 shows the overall steps that occur in the management of a case, however each case is different, and some of these processes must be executed out of order or partially completed at various times during case management. This problem arises due to scheduling conflicts, delays in forms processing, decision that must be jointly made by several family members and other case specific considerations. A major area for future enhancement is the implementation of a persistent case state attribute that tracks progression through this work flow and informs intelligent system or "wizard" type advice to the user.

Chapter 3. Electronic Forms and Database Structure

This chapter discusses the formats used by the electronic forms supported by AF-CARES 1.0. The software provides electronic form filling assistance to a set of electronic forms that are stored in the portable document format. A list of these forms is shown below.

Table 3: Supported Forms.

FORM NAME	FORM TITLE
DA Form 2386	Agreement for Interment
DA Form 4475-R	Privacy Act Statement
DA Form 7302	Disposition of Remains Statement
DD Form 149	Application for Correction of Military Record
DD Form 397	Clain Certification and Voucher for Death Gratuity Payment
DD Form 1172	Application of Uniformed Services Identificatin DEERS Enrollment Card
DD Form 1351-2	Travel Voucher
DD Form 1351-2	Travel Voucher
DD Form 1375	Request for Payment of Funeral or Interment Expenses
DD Form 1701	Inventory of Household Goods
DD Form 2656-7	Verification for Annuity
SGLV-8283	Claim for Death Benefits (Federal Employee's Group Life Insurance)
SGLV-8283A	Claim For Family Coverage Death Benefits
SF 180	Request Pertaining to Military Records
SF 1174	Claim for Unpaid Compensation of Deceased Member of the Uniformed Services
SF 1199A	Direct Deposit Sign Up Form
SF 2800	Application for Death Benefits (Civil Service Retirement System)
CSF Form FE-6	Claim for Death Benefits (Federal Employee's Group Life Insurance)
VA 21-534	Application for Dependency and Indemnity Compensation, Death Pension and Accrued Benefits for a Surviding Sp
SSA-24	Application for Survivors Benefits
VA 21-534A	In service Death Only
VA 21-535	Application for Dependency and Indemnity Compensation by Parent(s)
SSA-24	Application for Survivors Benefits
VA 21-4138	Statement in Support of Claim
VA 21-4142	Authorization for Release of Information
VA 22-5490	Application for Suvivors' and Dependents' Education Assistance
VA 29-4125	Claim for One Sum Payment
VA 29-4125A	Claim for Monthly Payments, National Service Life Insurance
SSA-24	Application for Survovors Benefits
FMS 2231	Faststart Direct Deposit
INS N-644	Application for Posthumous Citizenship
CIDMEMOCAO	Memo Requesting CID Report (Deliver to CAO)
CIDMEMOPNOK	Memo Requesting CID Report (Deliver to NOK)
DD 1300	Report of Casualty

Portable Document Format

The portable document format (PDF) is a proprietary electronic forms specification developed by the Adobe corporation[10]. PDF files have the advantage of portability. They may be viewed, edited, printed, and saved using the freely distributed Acrobat Viewer. All of the forms supported by the AF-CARES 1.0 software are available in PDF format, however, the forms are maintained by different agencies and each form has a unique underlying field structure. The PDF specification goes beyond form rendering and field filling and includes the capability to electronically sign documents. This electronic

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[10] Adobe, "PDF Reference, 5th Edition, Adobe Portable Document Format Version 1.6" Adobe Systems Incorporated, 2004.

signing feature is not implemented in AF-CARES 1.0, but is a consideration for future enhancements to the software system.
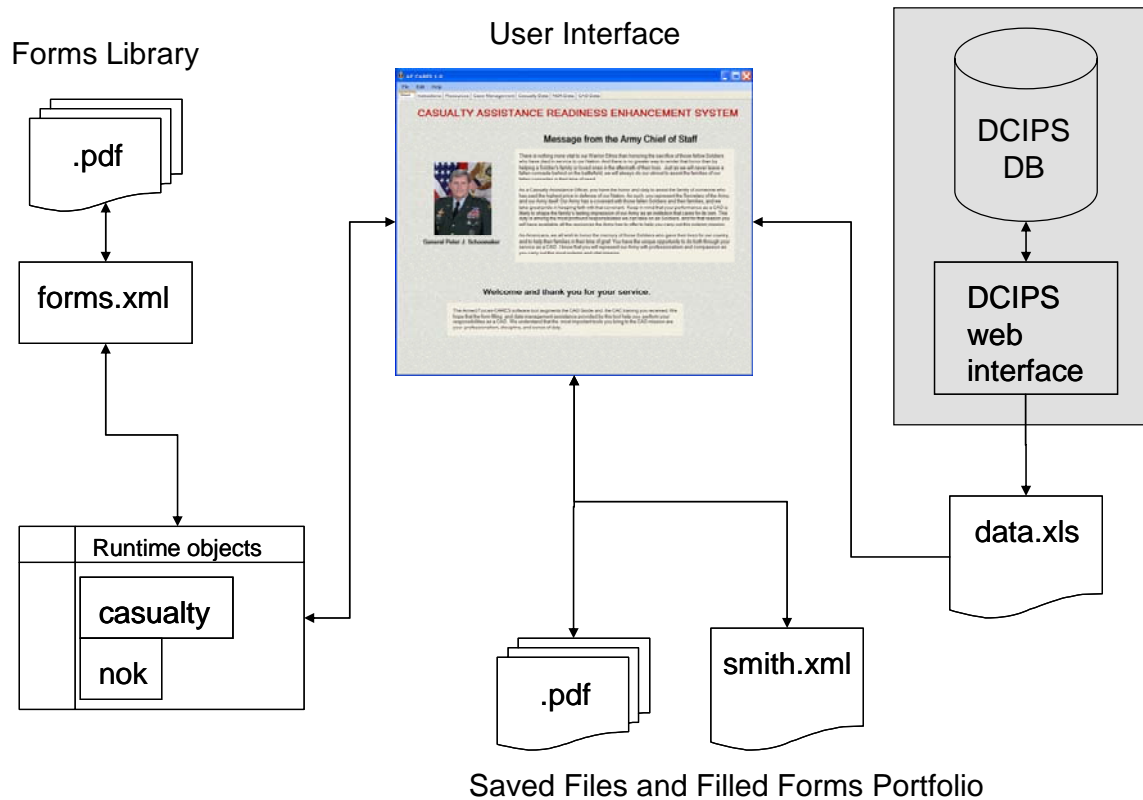
DCIPS Data Interface

The initial load of case data is generated as an Excel Spreadsheet extracted from the DCIPS database and downloaded to the host computer from the DCIPS portal.
The fields in this query are shown at Table 4 below.

Table 4: DCIPS Query Field Names.

| Field Name	Field Name
CASUALTY_FIRST_NAME	RELATIONSHIP
CASUALTY_MIDDLE_NAME	RELATIONSHIPCODE
CASUALTY_LAST_NAME	DECEASEDCODE
CASUALTY_SFX	DECEASED_DESCRIPTION
SERVICE_CODE	NOK_BIRTH_DATE
SERVICE	DEATH_GRATUITY
RANK	UNPAID_PAY_AND_ALLOWANCES
SSN	PADD
PEBD	PERE
BASD	NOK_HOME_ADDRESS1
CASUALTY_BIRTH_CITY	NOK_HOME_ADDRESS2
CASUALTY_BIRTH_STATE	NOK_HOME_CITY
CASUALTY_BIRTH_STATE_CODE	NOK_HOME_STATE
CASUALTY_BIRTH_CTRY	NOK_HOME_STATE_CODE
CASUALTY_BIRTH_CTRY_CODE	NOK_HOME_ZIP
CASUALTY_BIRTH_DATE	NOK_HOME_COUNTRY
DEATH_DATE	NOK_HOME_COUNTRY_CODE
FUNERAL_HOME	NOK_MAIL_ADDRESS1
FUNERAL_LOCATION	NOK_MAIL_ADDRESS2
FUNERAL_ADDRESS1	NOK_MAIL_CITY
FUNERAL_ADDRESS2	NOK_MAIL_STATE
FUNERAL_CITY	NOK_MAIL_STATE_CODE
FUNERAL_STATE	NOK_MAIL_ZIP
FUNERAL_STATE_CODE	NOK_MAIL_COUNTRY
FUNERAL_ZIP	NOK_MAIL_COUNTRY_CODE
NOK_FIRST_NAME	NOK_HOME_PHONE
NOK_MIDDLE_NAME	NOK_CELL_PHONE
NOK_LAST_NAME	NOK_BUSINESS_PHONE
NOK_SFX	NOK_EMAIL_ADDRESS
TYPEOF	NOK_OTHER_CONTACT
TYPEOFCODE	NOK_FAX

Future versions of the software may require alterations to this query, however, early in the case the DCIPS database may be populated with incomplete or incorrect information. The CAO verifies data early in the assistance process, and the run time and save file representations of the case permit correcting information and adding new information to

the case file. Figure 4 provides a schematic of the way the software interfaces with the DCIPS portal through the case query.

Figure 4: AF-CARES 1.0 Interfaces.

The DCIPS portal provides an initial set of case data as an Excel file. The working save file format for the case is an Extensible Markup Language file that is generated, saved and read by the software. Figure 5 is a more detailed diagram of functions that are implemented in AF-CARES 1.0 or are planned for implementation in AF-CARES 2.0. The AF-CARES 1.0 software provides the forms assistance functions shown in this diagram. Journaling is completed outside the software, and case assistance is still provided by subject matter experts at the CAC and CMAOC case manager level.
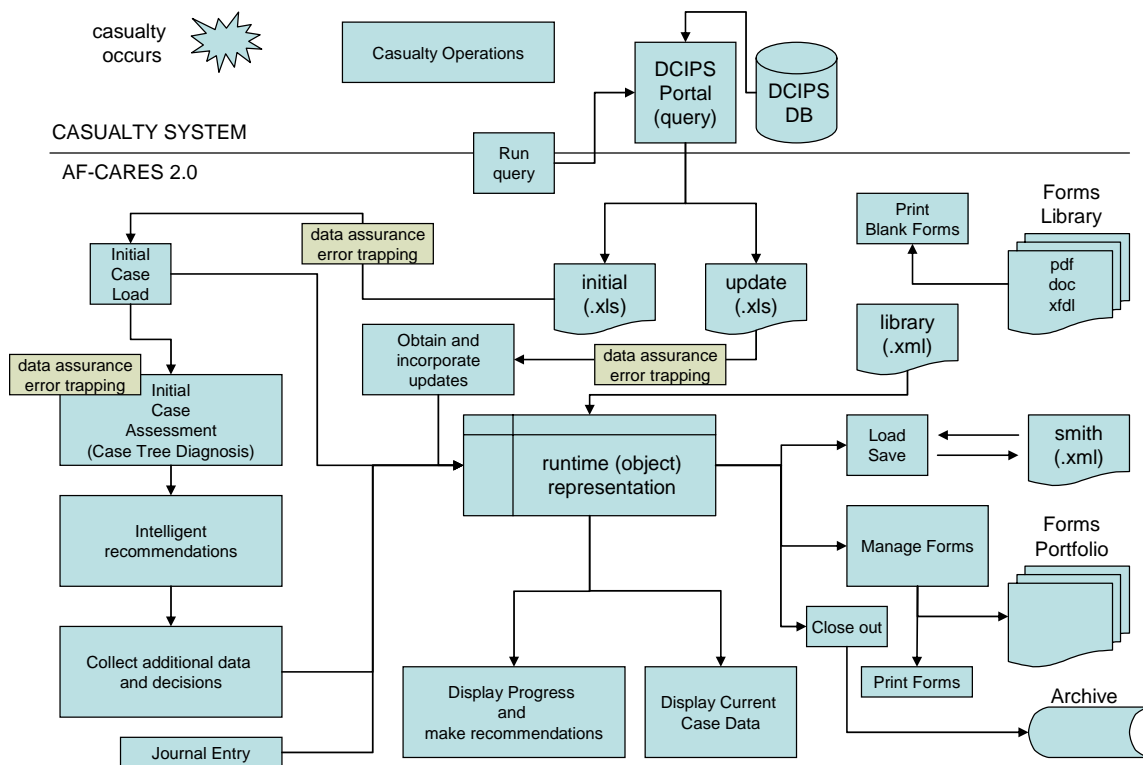
Figure 5: Functional Diagram

Figure 5 indicates some additional functionality that has been identified through feedback from users of the AF-CARES 1.0 software. Specifically, these areas include journaling, archiving, and intelligent case diagnosis and management assistance. The existing run-time representation of the case and the forms management functionality in AF-CARES 1.0 will form the basis for enhanced revisions to the software.

Chapter 4. AF-CARES Version 1.0 Software

The objective of this work is to provide a software tool to the people providing assistance to the families of deceased soldiers. The software tool developed in this work is called Armed Forces CARES version 1.0. This chapter provides and overview of the architecture, objects, and functionality in the software.

Architecture

The AF-CARES software provides form filling assistance to the user by defining an interface between a set of electronic forms and the data elements provided by the DCIPS database or obtained by casualty assistance officers. The software is written in the C# programming language[11]. The user interface was designed using the Microsoft Visual Studio 2005 integrated development environment[12].

Objects

The software architecture is firmly object oriented. The objects defined in the software encompass the state variable definitions and functions needed to define the roles of each object. The objects are generated as needed at run time, and populated with data through three possible sources:

- An initial case data load in Microsoft Excel format. This file is generated by a query of the DCIPS database, and serves as an initial set of information about the casualty and one or more next of kin. The Excel data file is read at run time by the C# application through the Microsoft Open Database Connectivity (ODBC) layer provided by the C# .NET framework in the OleDataAdaptor Class[13].
- A saved case file. As case management progresses, the software permits saving and loading a working case file in XML format. These case files contain all of the information read from the initial DCIPS database query and any information that has been added by the case managers.
- Information gained during case management. As the management of the case progresses additional information is gained about next of kin, casualty assistance officers, and decisions about disposition and benefits. This information is added to the object model through the user interface and is stored in the XML case files.

As forms are filled and edited they are stored in a case unique directory with unique file names in PDF format. These forms can be further edited, saved, and printed for signature and disposition.

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[11] Liberty, J., "Programming C#, Fourth Edition", O'Reilly, 2005.
[12] Parsons, A., and Randolph, N., "Professional Visual Studio 2005", Wiley, 2006.
[13] Metsker, S., "Design Patterns in C#", Pearson, 2004.

Case Data

The case data object contains information about the case and the directories in which data and forms are stored. The case data object holds a reference to the forms library, the Casualty Object and one or more next of kin and casualty assistance officer objects.

Casualty

The casualty object contains information about the individual casualty. This information includes for example, the name, social security number, and rank of the deceased. Because this information is stored in only one place in the data representation, and because this information is placed in form fields from this object representation, the likelihood of error in placing, for example, the same social security number on several forms is minimized.

Next of Kin (NOK)

A next of kin is a family member of the casualty. Next of Kin objects contain information about individual family members including their relationship to the deceased. The Primary Next of Kin is a special case of the class of Next of Kin individuals. The determination of an individual's status as Primary Next of Kin is made outside the scope of the software. The determination is already made at the time the case data is loaded from a query on the DCIPS database. The same data assurance advantages of holding, for example a next of kin social security number in only one place for use on several forms is facilitated by the object design.

Casualty Assistance Officer (CAO)

A casualty assistance officer is the individual who provides direct assistance to the family members of the deceased service member. Several CAOs may be assigned to any one case. The casualty assistance officer data is used to generate travel documents. Additionally, because of existing policy on the way in which reports of investigations may be provided to families, the CAO contact information is used in automatically generating requests for these investigative reports.

Form

A form object permits the mapping of object data onto form fields. The PDF format forms are maintained by several agencies. The Army Publishing Agency [14] maintains electronic forms in PDF format. The Veterans Administration also maintains a library of relevant forms[15]. All of these forms are provided with the application as a forms library, but as policy and form format changes over time, the software will need to be adapted to account for new forms and new form formats. The forms object, and the forms library

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[14] http://www.usapa.army.mil/
[15] http://www.va.gov/vaforms/

definition document described below permit changes to the forms library without requiring changes to the AF-CARES 1.0 application. In essence the form object is an abstract representation of what a form must do in order to be useful to the application[16].

PDF4NET API

The PDF4NET[17] application programmer's interface (API) specification provides all of the functions necessary to fill and edit the electronic forms supported by AF-CARES 1.0 from within the application. The API was developed by O2 Solutions and licensed to this project as an embedded distributable .dll library.

XML Forms Library

The supported forms library is defined in a single extensible markup language (XML) document. This document provides a mapping between the field names in a particular electronic form portable document format file and the object names used in the object representation of case information. An example of a form specification in this xml library definition is shown here:

```
<form>
  <name>SF180</name>
  <fileName>SF180.pdf</fileName>
  <title>Request Pertaining to Military Records</title>
  <description>. . . .</description>
  <special>False</special>

  <formField>
  <formFieldName>NameUsed</formFieldName>
  <objectFieldName>casualty_lfmi</objectFieldName>
  </formField>
  .
  .
  .

</form>
```

XML Save File Format

Working case files are saved in an XML format. The save file contains a complete representation of the know object data. The software contains reader and writer functions that use the standard C# .NET XML management objects[18].

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[16] Gamma, E., et al., "Design Patterns, Elements of Reusable Object-Oriented Software", Addison Wesley, 1995.

[17] http://www.o2sol.com/pdf4net/products.htm

[18] Esposito, D., "Applied XML Programming for Microsoft .NET", Microsoft Press, 2003.

User Interface

The user interacts with the AF-CARES 1.0 software through a graphical user interface. This interface is designed to follow the basic flow of managing the forms for an individual case. The interface provides for reading an initial case data set, saving, and opening working cases, and manipulating case data as it becomes available throughout the management of the case.

The interface uses a tabbed layout with tabs for:

- Start
- Instructions
- Forms Management
- Resources
- Casualty Data
- NOK Data
- CAO Data
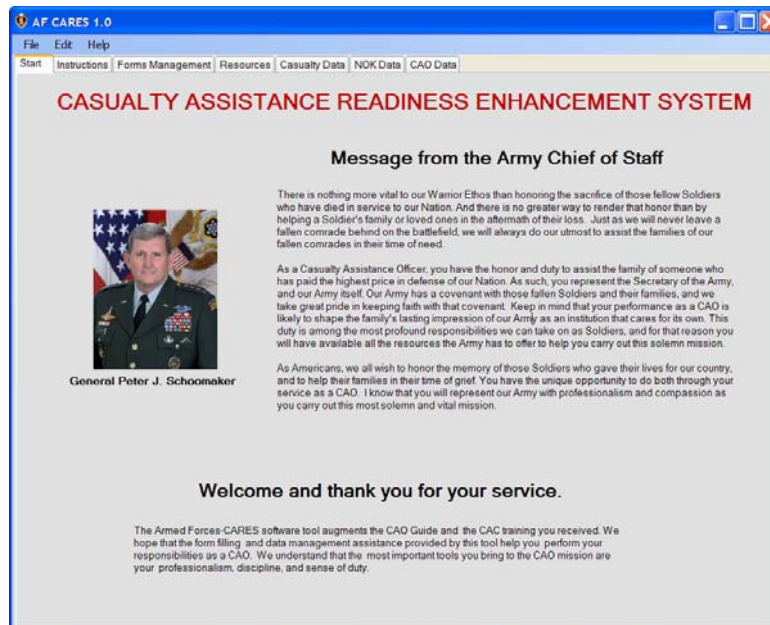
Figure 6: AF-CARES 1.0 Start Tab.

The start screen provides an introduction to the user (Figure 6). The instruction screen (Figure 7) gives a very simple overview of the way a case is managed using the tool. The instructions tab also provides a direct email link to the developer.
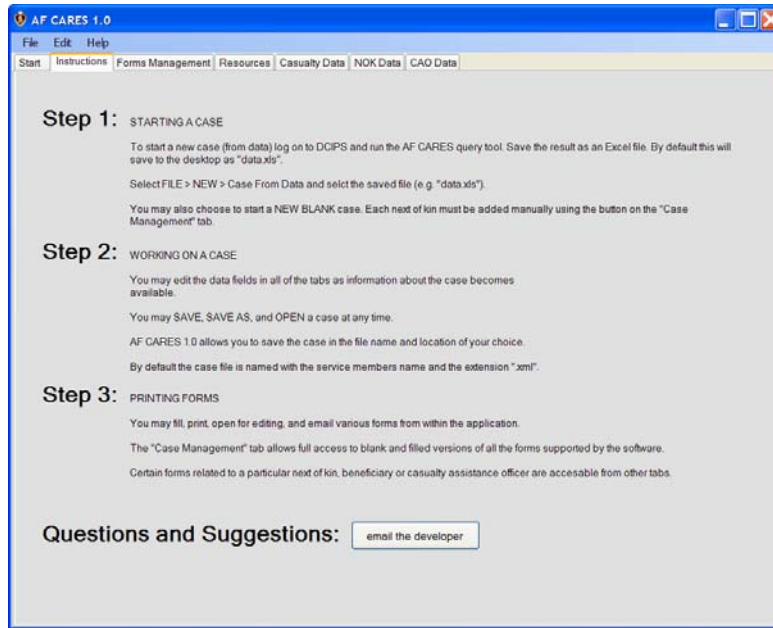
Figure 7: AF-CARES 1.0 Instructions Tab.

The forms management tab provides access to all of the supported forms for filling, editing, and printing. As forms are filled for a particular case they are added to the list of filled forms. This list is maintained on save and load of the case. The forms management tab also provides a function for adding a next of kin to the case. As forms are filled they are copied to a uniquely named file specific to the case and next of kin. The forms management tab provides a function to batch print the entire set of blank or filled forms. As forms are filled by the application the Adobe Acrobat Reader[19] is launched for inspection and further editing of the forms. AF-CARES 1.0 requires Adobe Acrobat for forms manipulation outside of the application.

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[19] http://www.adobe.com/
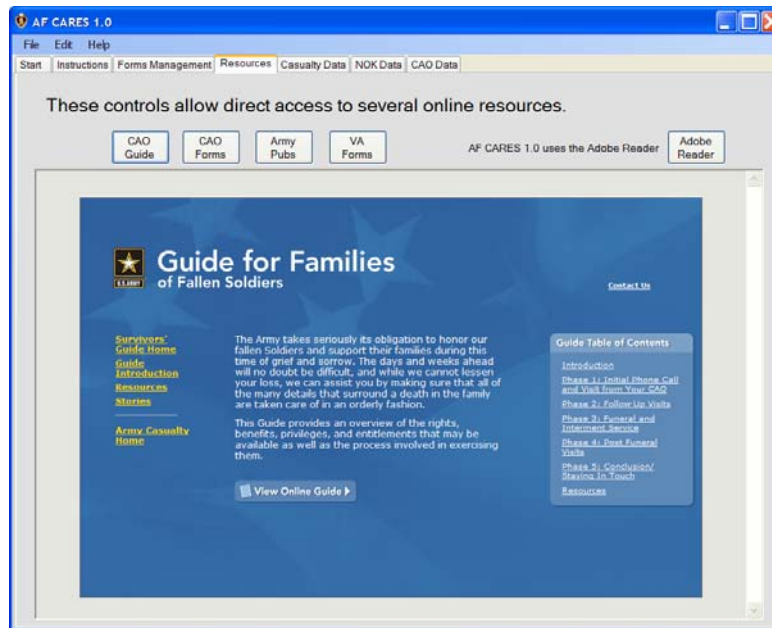
Figure 8: AF-CARES 1.0 Resources Tab.

The resources tab (Figure 8) contains an embedded web browser with links to casualty assistance and forms resources, and to the Adobe Acrobat download web site.

The casualty data tab (Figure 9) contains information about the casualty.

Figure 9: AF-CARES 1.0 Casualty Tab

The NOK data tab (Figure 10) contains a separate tab pane on which each NOK appears as a tab.

Figure 10: AF-CARES 1.0 NOK Data Tab.

The CAO data tab (Figure 11) contains information about the CAO assigned to this case. The menu bar provides for creating anew case from data, saving and opening cases from saved case files, and exiting the application. The help menu provides an about dialog box and a dialog with explanations of known issues in usage.

Figure 11: AF-CARES 1.0 CAO Data Tab

The user interface is designed to be simple, but it can be expanded to encompass additional functions in later versions. The control objects in the user interface (e.g. text fields, check boxes) are linked to the underlying object model through the C# data binding framework. This means that as the user manipulates the fields in the user interface[20], he is also manipulating the state of the underlying run time object representation. As an example of the use of the data binding functionality in C# user interface design, the software provides a control for adding a new NOK. When the user adds a NOK to the existing collection of NOKs, the software generates a new NOK control, adds this control to a new tab in the NOK Tab page, and then sets this control's binding source to the new NOK object:

```csharp
private void addNokButton_Click(object sender, EventArgs e){
    int i = theCase.theNOK.Count;
    if (i == 0){
        NOK n = new NOK(theCase);
        theCase.theNOK.Add(n);
        NOKControl nk = new NOKControl(n);
        this.NOKTabs.TabPages.Add(theCase.theNOK[i - 1].Nok_FML,
          theCase.theNOK[i - 1].Nok_FML);
        this.NOKTabs.TabPages[i].Controls.Add(nk);
        this.NOKTabs.TabPages[i].DataBindings.Add(new Binding("Text",
          nk.nOKBindingSource, "nok_FML"));
        nk.nOKBindingSource.DataSource = theCase.theNOK[i - 1];
        nk.nOKBindingSource.ResetBindings(false);
    }
    else{
        NOK n = new NOK(theCase);
        theCase.theNOK.Add(n);
        NOKControl nk = new NOKControl(n);
        this.NOKTabs.TabPages.Add(theCase.theNOK[i].Nok_FML,
          theCase.theNOK[i].Nok_FML);
        this.NOKTabs.TabPages[i].Controls.Add(nk);
        this.NOKTabs.TabPages[i].DataBindings.Add(new Binding("Text",
          nk.nOKBindingSource, "nok_FML"));
        this.NOKTabs.TabPages[i].DataBindings.Add(new Binding("Name",
          nk.nOKBindingSource, "nok_FML"));
        nk.nOKBindingSource.DataSource = theCase.theNOK[i];
        nk.nOKBindingSource.ResetBindings(false);
    }
}
```

---

[20] Parsons, A., and Randolph, N., "Professional Visual Studio 2005", Wiley, 2006.

Chapter 5. Conclusions & Recommendations

This work provides a functioning software tool to the people who execute the casualty assistance process. It is a first milestone in the process of fielding useable software assistance that meets the defined needs of users at several echelons in the casualty assistance system.

Lessons Learned from Deployment

The test software developed in previous work[21] was alpha tested for usability and functionality by members of the Department of System Engineering and by selected personnel at the CMAOC during August and September of 2006. Based on these tests the project managers at CMAOC decided to proceed with the development of a stand-alone forms assistance tool for deployment to the CACs. The initial version of the software described in this report was deployed to six CACs in December of 2006:

* Fort Huachuca
* Fort Campbell
* Fort Lewis
* Fort Meade
* Fort Stewart
* Fort Drum

Several lessons were learned in this preliminary deployment.

* The software had rigid working directory management.
* The users were not authorized to perform the installation.
* Local policies among the regional CACs varied with respect to installing software applications built by an Army agency.
* The installation instructions were in a readme.txt file embedded in the zipped deployment archive. Users who did not know how to open this archive could not access the installation instructions.
* The software did not handle less than perfect data sets, it would break on a missing casualty social security number or badly formed Excel spreadsheet tab label in the DCIPS extract.

Using lessons learned from this deployment, minor upgrades were incorporated into the software, and a larger scale deployment, using the DCIPS and AKO portals was conducted during February of 2007. A more thorough installation guide (Appendix A) was also made available through he AKO portal. The CACs using the software have provided feedback through the AKO portal and through surveys administered by the Operations Research Center, and through informal communications with the development

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[21] Technical Report DSE-TR-0619, DTIC# ADA4490018, August 2006

team. This feedback is being incorporated into the development of AF-CARSE 2.0. The current list of users by AKO username is shown in the following table:

Table 5: AKO Users of AF-CARES.

brian-sperling	shirley.hartmann	ernest.wong
cherri.lawless	debra.rushbrook	simon.goerger
antoinette.graves	manuel.sariego	debbie.macmillan
hazel.vukovich	patricia.rochester	antoinette.oconnor
kenneth.grimes	grant.dewey	darlene.sandlin
mark.winburn	donny.philips	barbara.bonnell
albert.brown1	kent.fearns	joann.uitenham
gary.kramlich	tina.patterson1	kennon.gilliam
patricia.george	albertha.savage	randy.f.rothleutner
brenda.bowser	bob.amico	rubina.gray
jakayla.mobley	tysheika.brown	priscilla.r.montano
lee.r.price	jim.field	matthew.brown23
janie.l.ware	ella.freeman	isaac.yancey
jeffrey.w.clark	tomas.o.montanez	michael.bradwick
yolanda.lopez	randy.l.wheeler	steve.andrew.morgan
tracey.richardson1	mikki.arthur	sheila.phillips1
kimberley.m.mckenzie	rick.revels	frederick.calladine
lola.m.coble	albert.l.mcfarland	rose.pogue
timothy.rothrock	michael.barber	kim.kimbrough
lei.lana.gates	leslie.stewart	sidney.luster1
luis.a.santana	merita.ham	scott.james.bowen
paul.evangelista	stefan.ohlenmacher	robert.e.liedle
kelly.g.eickenbrock	timothy.w.adams	christine.fenton
tammy.branson	eddie.miles	wanting.hung1
joyce.l.land	stephen.hollis	nancy.ann.higgins
		gregory.pruett

Recommendations for Future Work

The assistance provided by the tool is limited to forms filling, and is limited by the electronic forms formats supported. The future of Army electronic publishing is in the e-forms initiative. The principal recommendation of this work is the development of Armed Forces Casualty Assistance Readiness Enhancement System 2.0 software that meets more of the needs of the users and incorporates the functionality of the emerging electronic forms architecture.

The following areas of additional functionality should be considered for incorporation into the 2.0 version of the software.

- Word Document management
- XFDL document management
- Journaling
- Address book and contact management

- Intelligent case diagnosis
- Intelligent case management flow advising
- Case Archiving
- In line help screens

The functional requirements of this future work are shown in the functional hierarchy at Figure 12.

The AF-CARES 2.0 release should also incorporate in-line help functionality and should include a brief instruction guide.
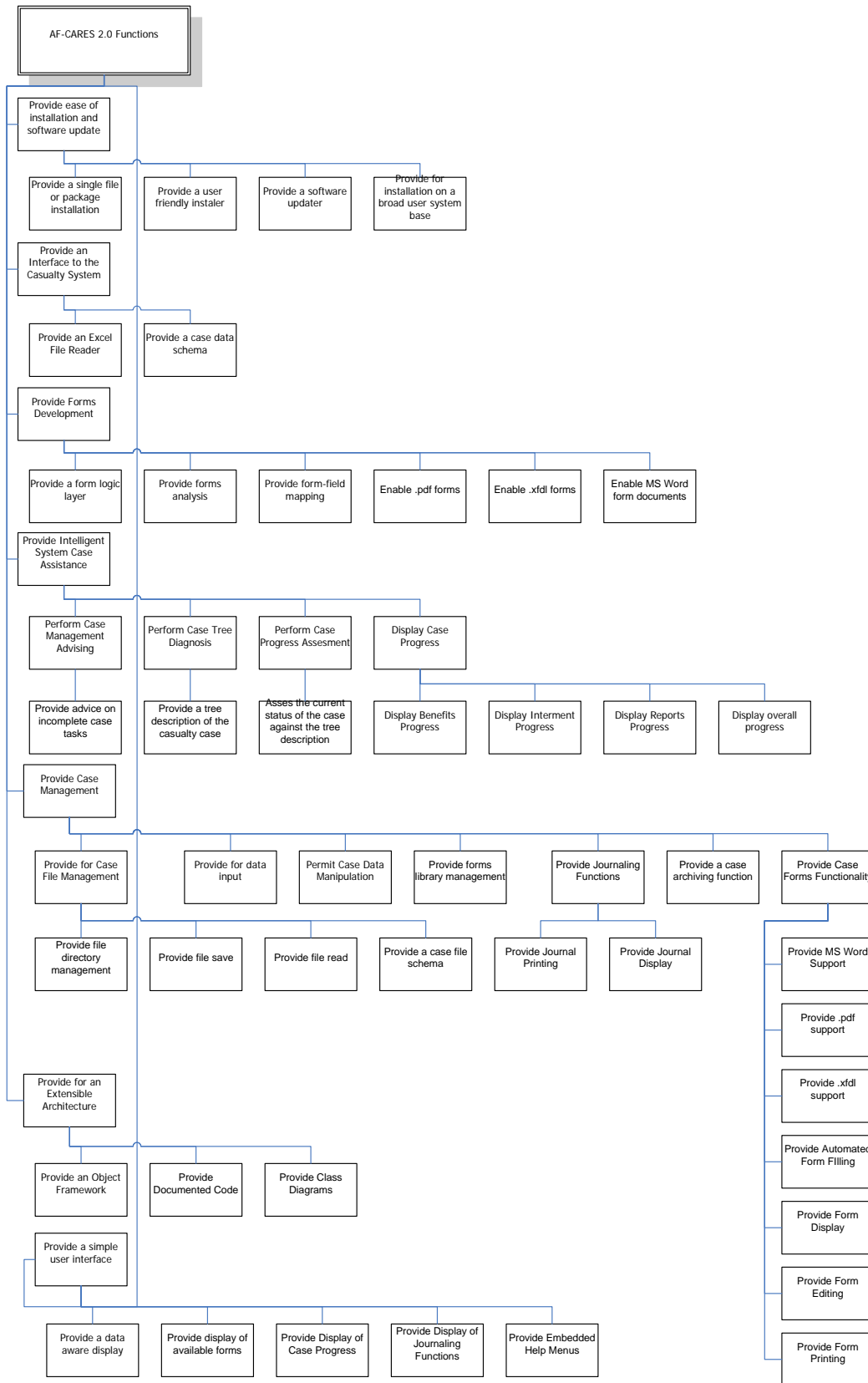
Figure 12: Functional Hierarchy.

Conclusions

The development of a useable software tool for deployment to the community of personnel who execute the casualty assistance mission presents unique challenges that extend beyond those challenges associated with any software development effort. This work has provided functioning software, but more importantly has defined the system, its functions, boundaries, interfaces and processes within which the software is designed to operate. It has defined a software architecture based on a run time object representation of the system and its major components. It has provided the framework under which to make major design decision decisions about the software including:

- User modality,
- Architecture,
- Development Environment,
- System Interface,
- Deployment,
- Support, and
- Upgrade Path.

These definitions and decisions should be used in the development of a more comprehensive software solution that meets a larger set of user needs, and ultimately leads to enhancement of our collective performance of the casualty assistance mission.

Appendix A Installation Instructions

Installation instructions for ARMED FORCES CARES 1.0
(Instructions current as of 5 Feb 07)

Introduction

These instructions should provide you with enough information to download and install the Armed Forces Casualty Assistance Readiness System Version 1.0 Software.

> IN ORDER TO INSTALL THE SOFTWARE YOU MUST BE A SYSTEM ADMINISTRATOR OR HAVE ADMINISTRATOR PRIVILEDGES ON YOUR COMPUTER.

Installation requires you to:

1. Download the software from either DCIPS or the AF-CARES Knowledge Center on AKO.
2. Extract the downloaded zip file or zipped folder using winzip or the default Microsoft file compression software.
3. Run the software installation.
4. Install Microsoft .NET 2.0 Framework (if it is not already installed on your computer).

> IF YOU HAVE A VERY STRANGE COMPUTER CONFIGURATION, YOU MAY RUN INTO PROBLEMS WITH INSTALLING. IF YOU HAVE VERY LITTLE EXPERIENCE WITH INSTALLING SOFTWARE YOU SHOULD GET HELP FROM AN EXPERIENCED USER OR FROM YOUR IT STAFF.

The following pages will take you through the installation steps

Downloading the Software

You can download the software from two different locations. The first is the DCIPS portal. If you have a DCIPS login and password you should be able to see the option: "AF-CARES Application Download" under the APPLICATION LISTINGS heading.
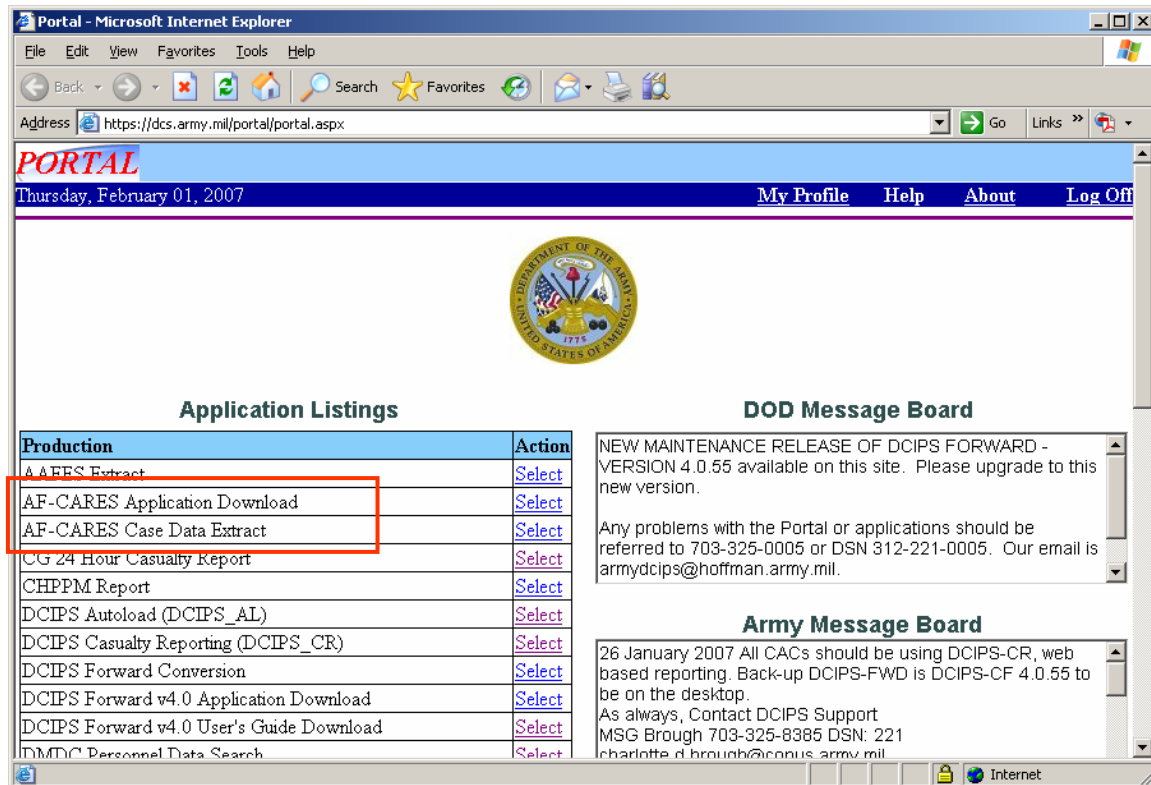
Once you have this zipped folder you can transfer it freely among local computers (for example using a memory stick).

If you are having problems getting the folder from DCIPS, there is an alternative download site on Army Knowledge Online. Contact LTC Henderson dale.henderson@usma.edu or dale.l.henderson@us.army.mil for access to the AKO site. In order to get the file from AKO, you need to search for and navigate to the AF-CARES KNOWLEDGE CENTER on AKO. On the right side of the AF-CARES page, there is a folder with the title "Software." Click on the word "Software" to open the folder. The folder contains a zipped archive of the software titled "Deployment." If you click this file, you will be given the option to download it.

Download the zipped folder "Deployment" from DCIPS or AKO onto your desktop.

You can not install the software from the zipped folder. You must extract it first.

Extracting the Folder

These instructions will take you through two possible ways to unzip the zipped file called "Deployment.zip" that should now be on your desktop.

Using the Microsoft zip software

On some computers you may extract the folder by right clicking on it.

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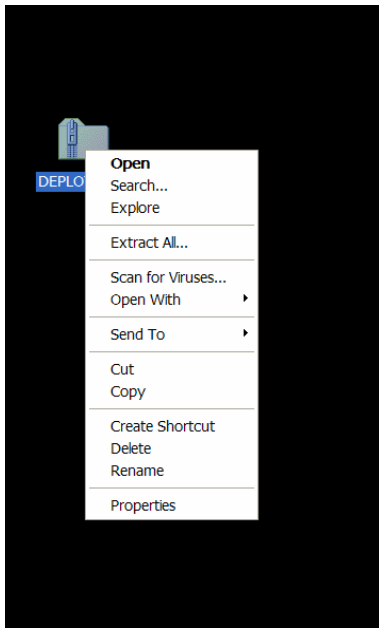
Select "Extract All." This brings up the folder extraction wizard.
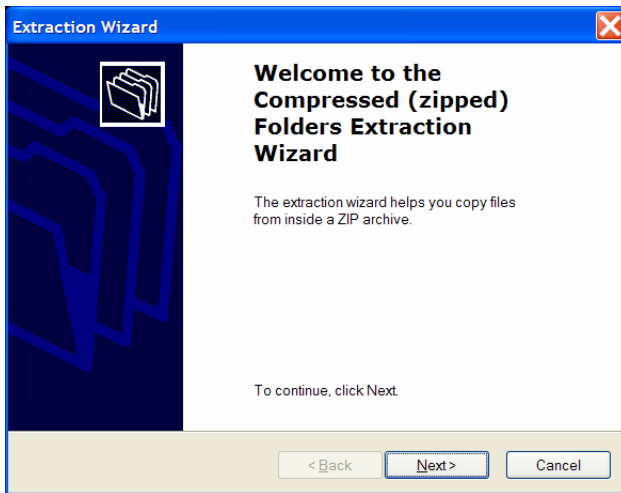
Select Next>.

To extract to a folder on the desktop select next again.
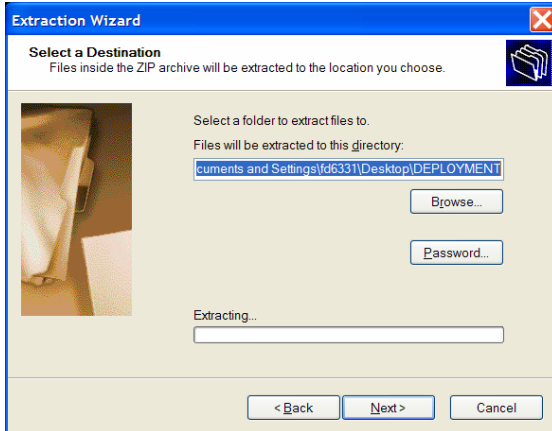
You will get an extracting progress bar as the folder extracts.
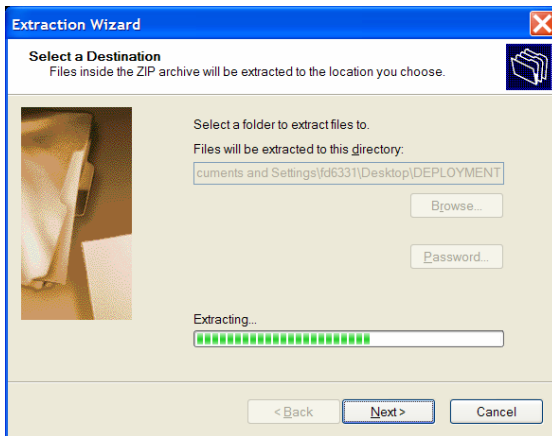
Select finish to close the folder extraction wizard.
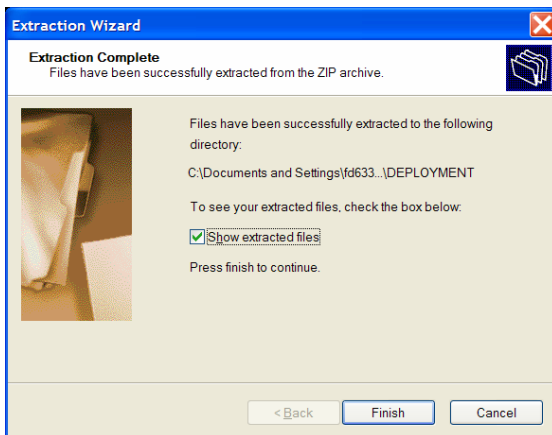
The extracted folder should open.
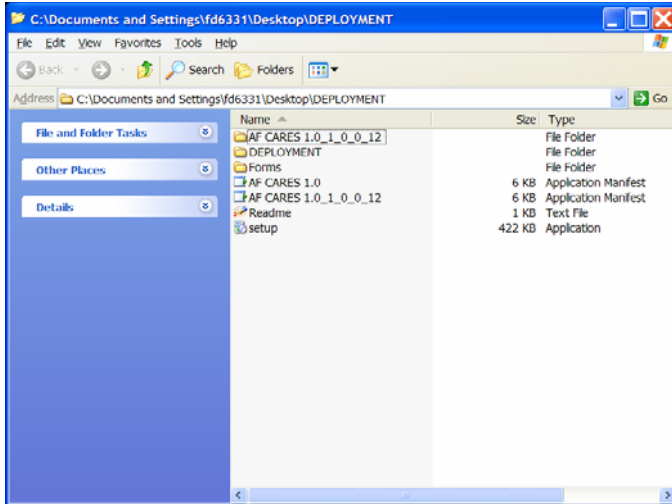
If the folder does not open automatically, there should be a new folder on your desktop called "Deployment." The zipped folder will still be there, but the new folder will not have the zipper symbol.
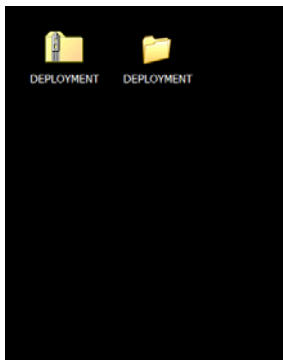
Using WinZip

IF YOU ARE USING Winzip. The downloaded zipped folder will have a different icon:
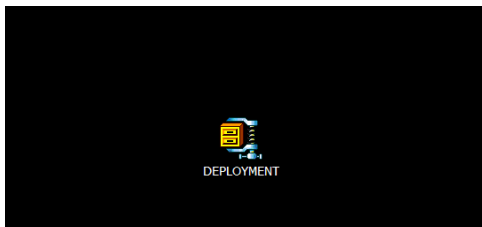
Right click on the DEPLOYMENT zipped folder.

Extract the folder to your desktop.
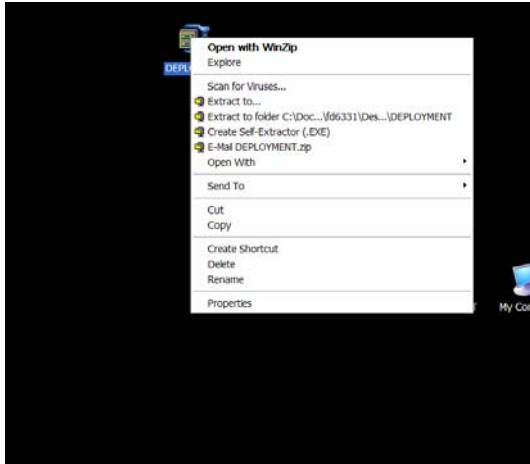
If you double click the DEPLOYMENT zipped file it will extract the folder to a different location.
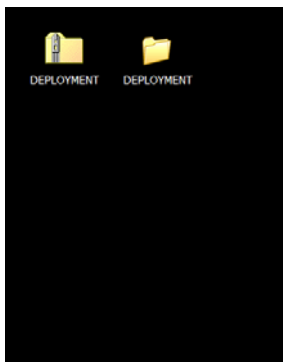
It should open this folder. You will need to drag the DEPLOYMENT folder to your desktop.
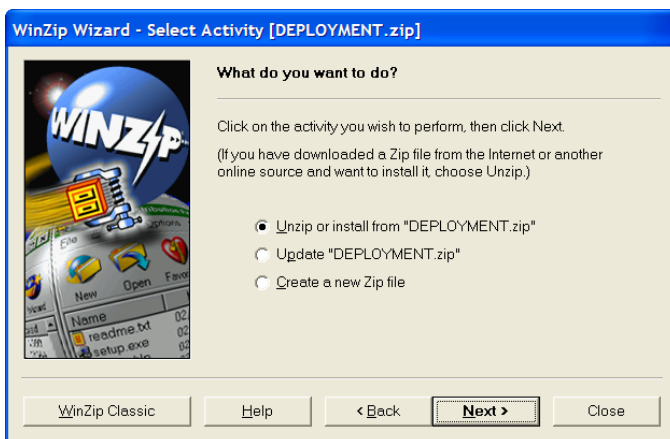
 click next.

click unzip now.
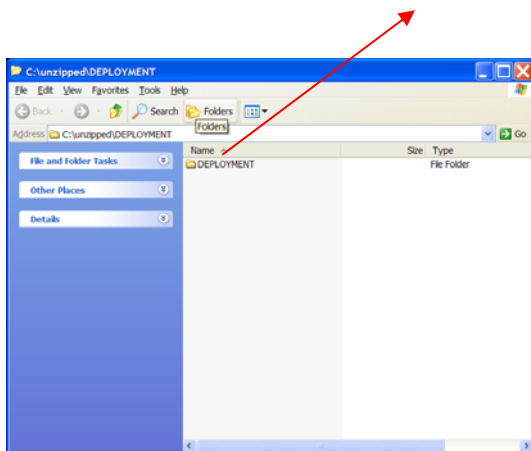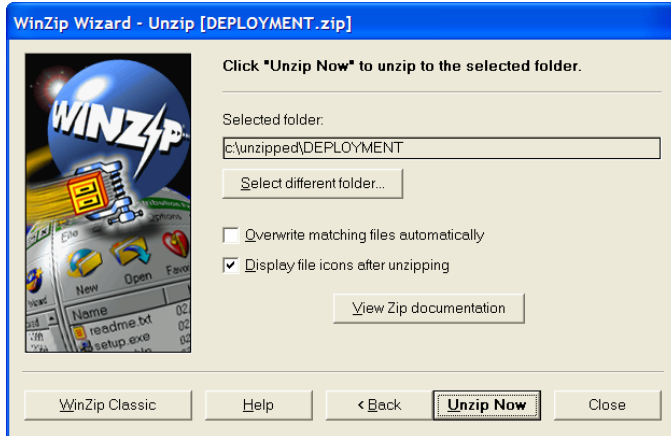
Once you have an unzipped deployment folder on your desktop you can precede with the installation.

Installing the Software

Open the "DEPLOYMENT" folder by double clicking it.
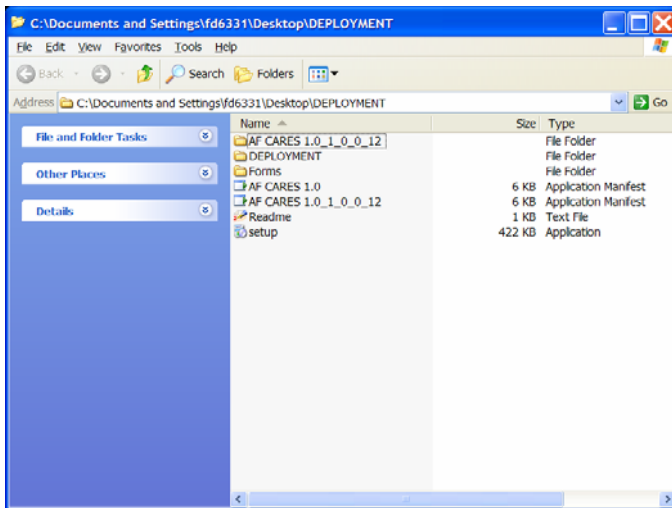
Moving the Forms Directory

The "FORMS" directory must be moved to the root of the C: drive C:\.

To do this, double click My Computer.

34
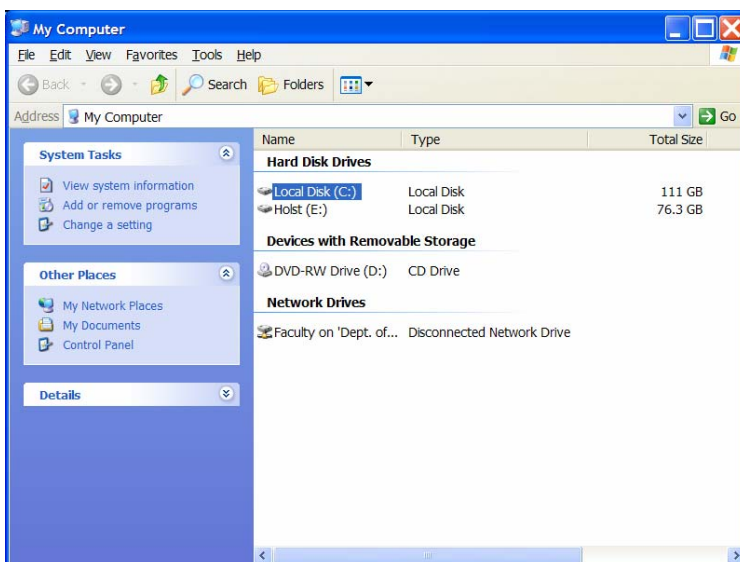
Now drag the folder "Forms" to the folder "Local Disk (C:)".
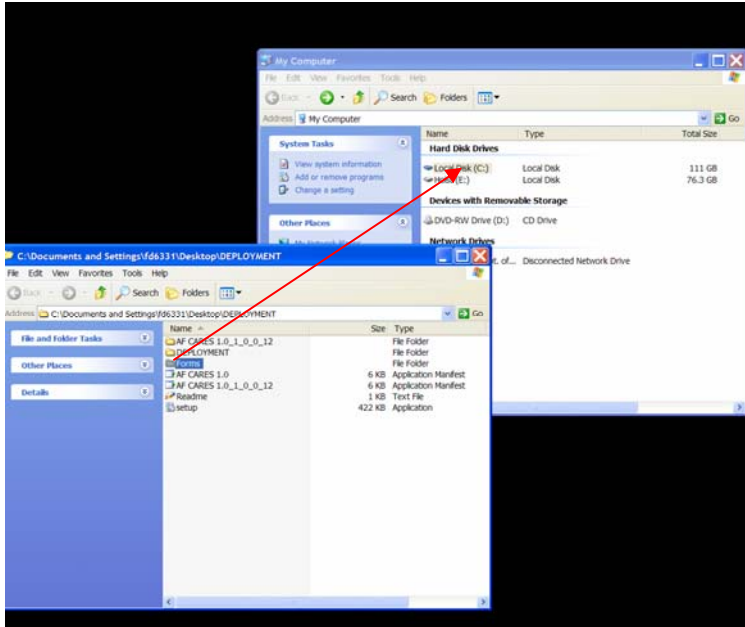
This will copy the AF-CARES Forms directory to the correct place on your hard drive.

Running Setup.exe

Next: Double click on setup.exe.
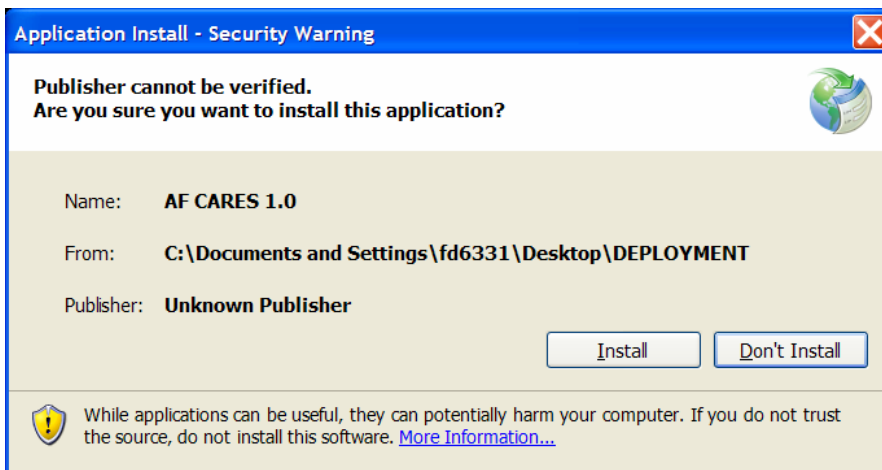
You get an installation warning.

We do not have a publishing certificate for this program. It is in development at the Operations Research Center in the Department of Systems Engineering at West Point. The lead developer is LTC Dale Henderson. dale.l.henderson@us.army.mil.

If your local policy permits you to install it, click "install." You need administrator privileges to install.

.NET Framework 2.0

IF YOUR COMPUTER ALREADY HAS THE .NET FRAMEWORK 2.0 INSTALLED, THE APPLICATION SHOULD INSTALL AND LAUNCH.

IF IT DOES NOT HAVE THE .NET FRAMEWORK 2.0 INSTALLED YOU WILL NEED TO INSTALL IT.

Click accept to begin the .NET installation.
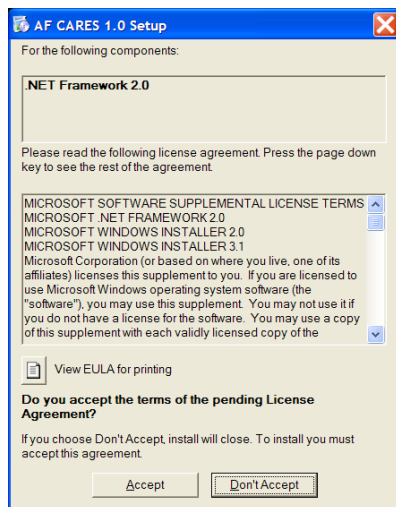
You will get a progress bar as .NET downloads the required files from Microsoft. This takes some time. You have to be connected to the internet for it to work.
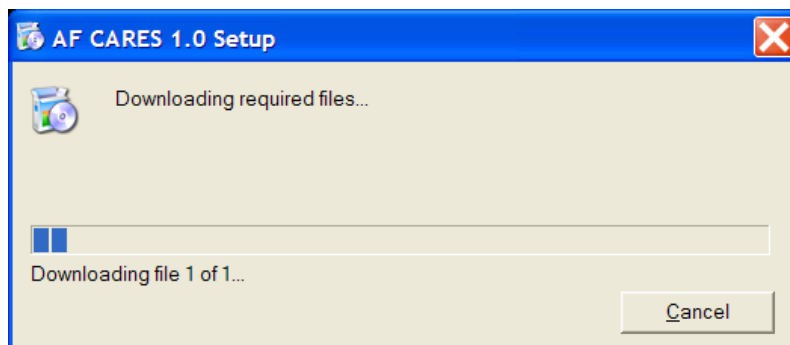
Once .NET is installed you will get the AF-CARES installation message.

Click install. The application will install (very quickly) and should then open.
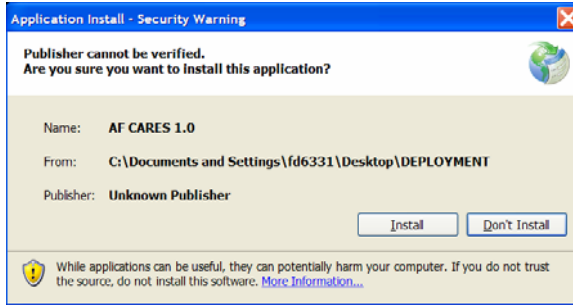
The application start window looks like this:
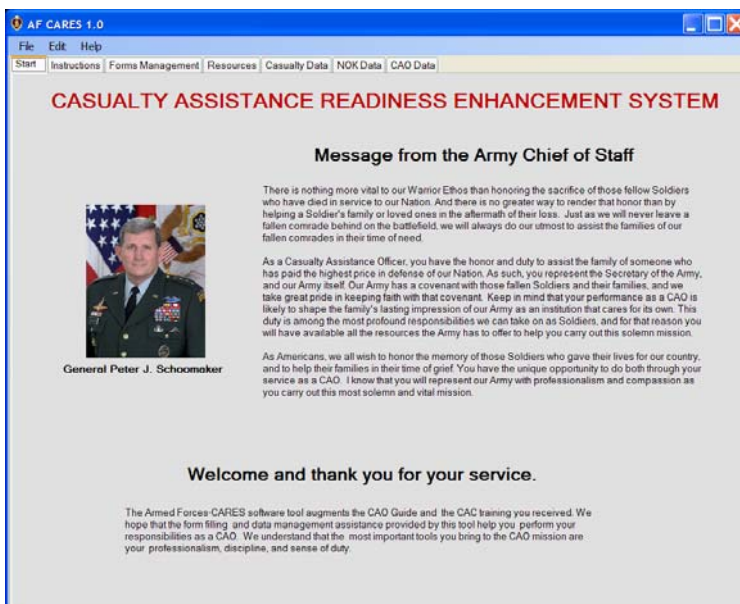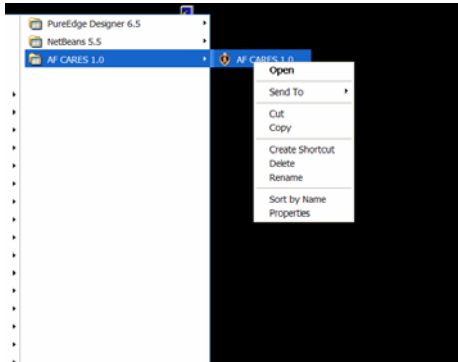

Start Menu and Icons

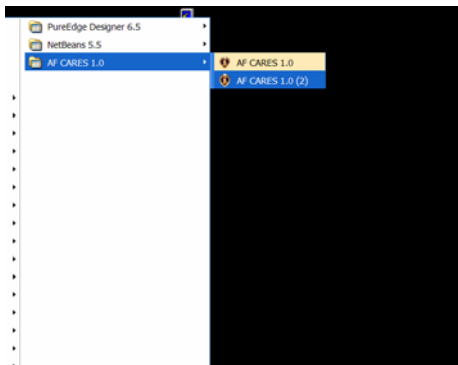You should also now have a START MENU ITEM for the software.
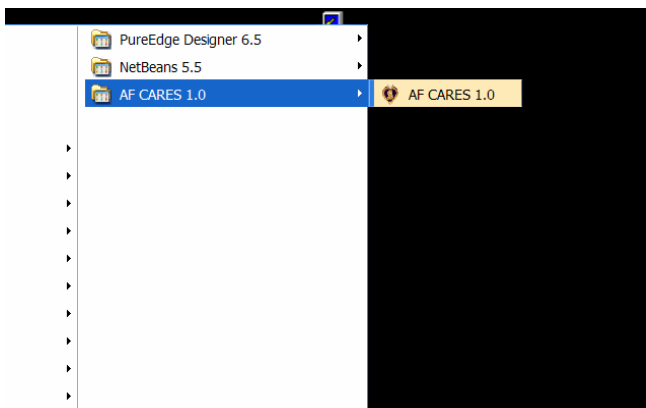
To run AF-CARES you should be able to go to Start > AF-CARES 1.0 > and select the program AF-CARES 1.0.
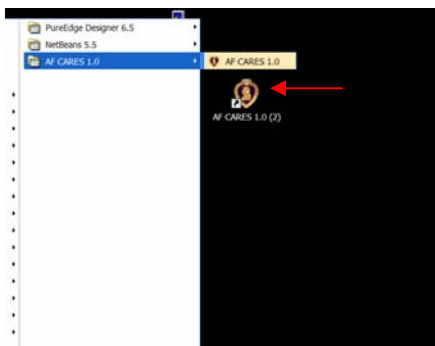
Making a Desktop Shortcut:

Right click on the AF-CARES 1.0 Program Menu item and select "CREATE SHORTCUT."

Now there should be 2 Icons. Drag the second icon to your desktop.

You can now launch AF-CARES 1.0 from your desktop by double clicking the program icon (purple heart).

Problems and Fixes

Here are some known issues with the installation.

1) One user found that the downloaded zip folder had no subfolders in it. Winzip basically tool away all the sub folders. The best solution I can think of for that is for you to write me and I can burn you a disk and mail it to you.
2) Some users do not have local permission to install software on their computers, and their IT personnel can not get permission from their Directorate of Information Management (DOIM) to install it. I am working with our DOIM to get some kind of certificate for general installation. Until I can work that out you may have your DOIM folks contact me directly to see if they can let you install and run the software as an exception. This appears to be a matter of local policy, as many installations are allowing CACs to install and use the software.
3) Some users are not seeing the download option on their DCIPS portal. I think DCIPS has fixed this. The quick fix is to use AKO. If you can't find the AKO site, email me
4) The program crashes or can't find the forms library. The forms library has to be at C:\Forms. It may be in some other place. The best fix is to drag the whole folder "Forms" to the root (C:\) as shown in the instructions.

Please be patient and provide feedback with this. This is the first cut a deploying useable – rather than test– software. We can and will improve it over time, and it will evolve very quickly into something that will provide a lot of utility.

Please contact me with your problems and bugs.

```
LTC Dale L. Henderson, Ph.D.
Assistant Professor and Deputy Director,
Operations Research Center
W: 845 938 5539
C: 845 238 1234
dale.henderson@usma.edu
dale.l.henderson@us.army.mil
dale.l.henderson@us.army.smil.mil
dalehenderson@mac.com
```
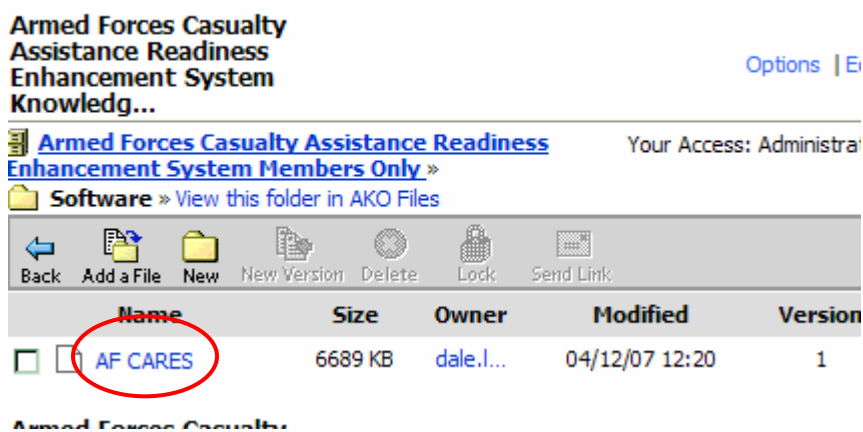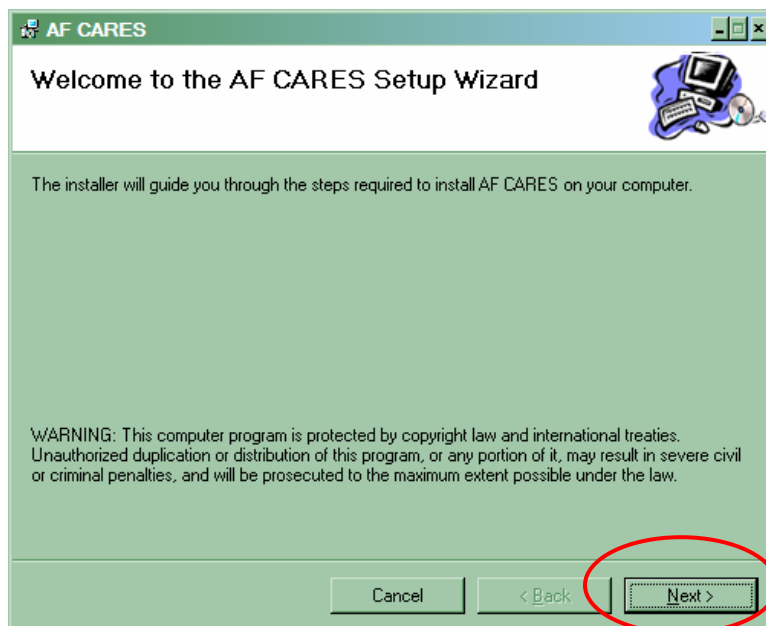
Appendix B Simplified Installation

These instructions tell you how to install the AF-CARES software from the file "AF CARES.msi".

Installation is now a two set process:

1. Download the AF CARES.msi Microsoft installer file from the AKO Knowledge Center.
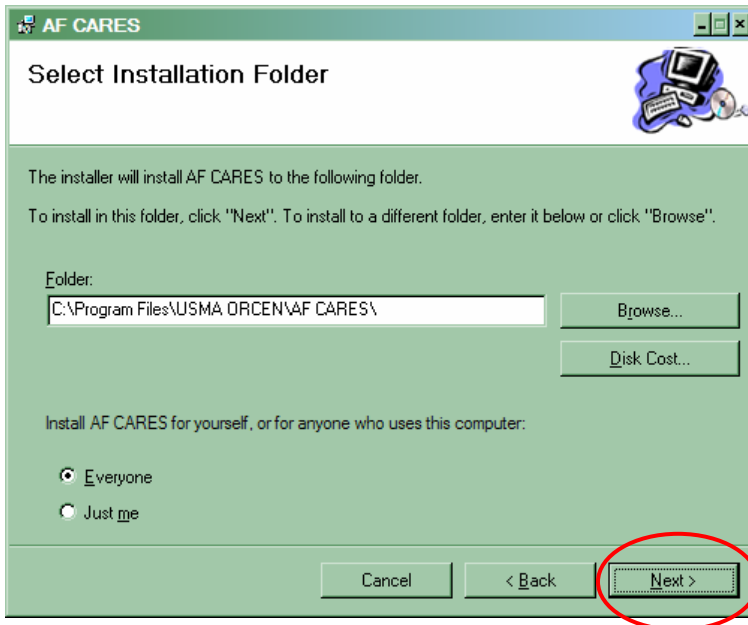

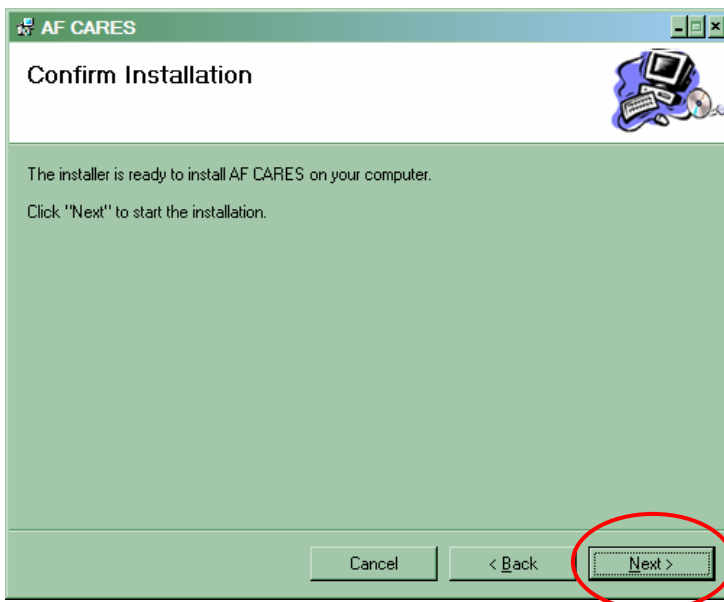2. Double click on the file. You will be taken to the AF-CARES Setup Wizard.

Click NEXT.

You can just click NEXT on this screen to accept the defaults.
The defaults will install the program to the directory shown, and make the program available for all users.

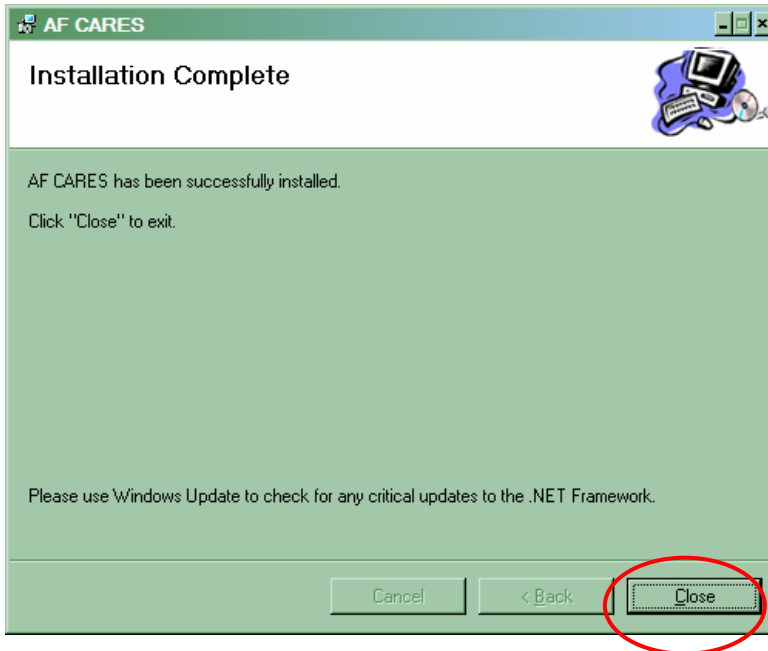You will get a Confirm Installation screen:

Click NEXT

The installer should add an AF-CARES shortcut icon to your desktop and install the forms library in the C: directory.
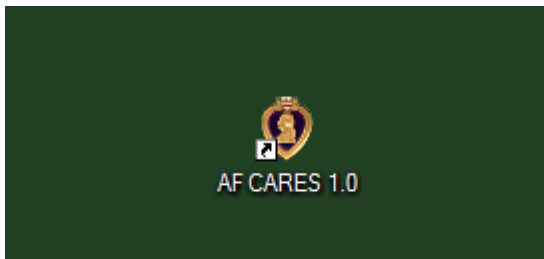
The program itself is installed in C:\Program Files.

You will get an Installation Complete screen:

Click Close to close out the installer.

The AF CARES 1.0 Shortcut Icon looks like this.

Double click to run the software.

Appendix C AKO Knowledge Center

Distribution and maintenance of the software has been facilitated by the creation of a knowledge center under Army Knowledge Online (AKO). This knowledge center provides for software download, discussion, and group member management. Group membership grew rapidly to 76 members, and continues to grow.
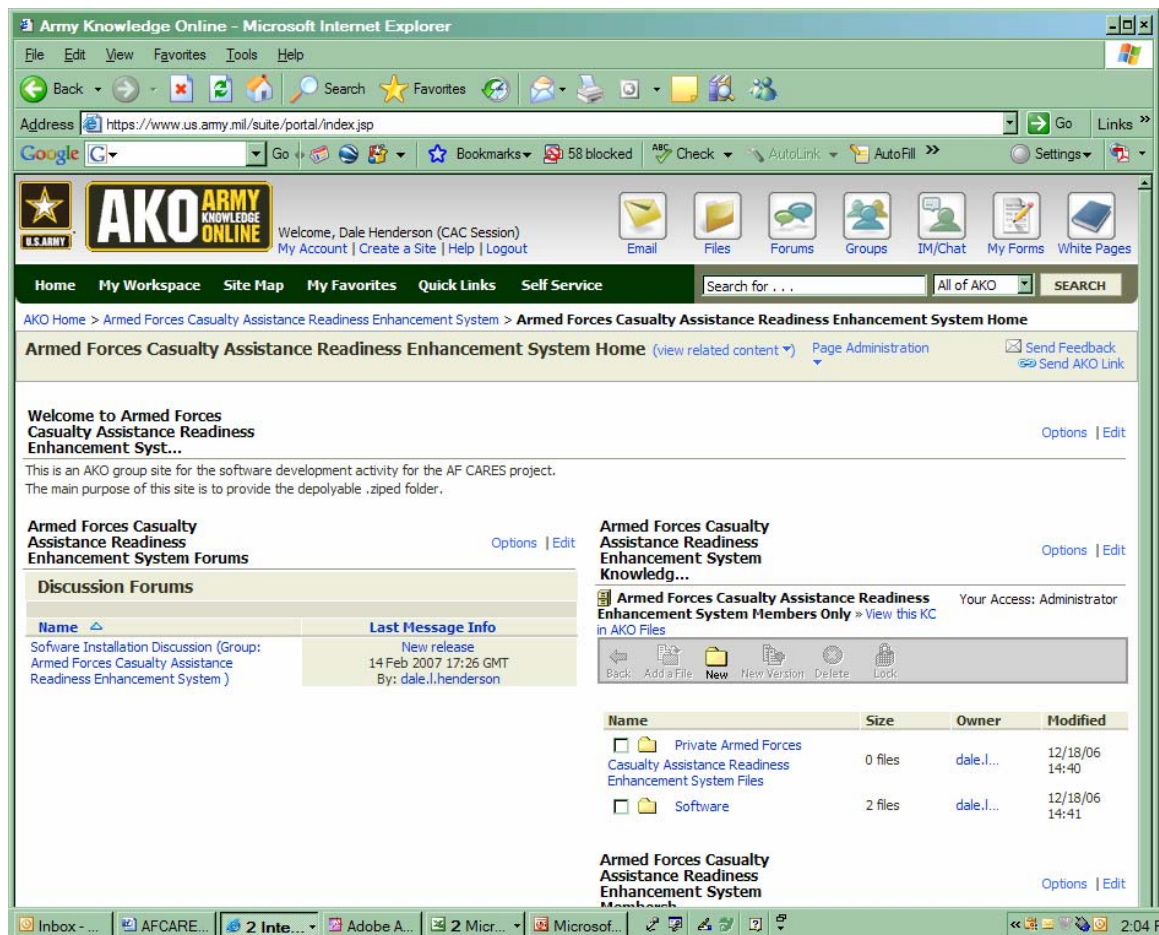

Figure 13 AKO Knowledge Center

Users obtain authorization to participate in the knowledge center by contacting the administrators, currently LTC Henderson. Users are added to the knowledge center through the group management functions of the web site.

Authorized users can access the AKO Knowledge center by searching in the main AKO portal for "Armed Forces Cares Casualty Assistance Readiness Enhancement System" and then clicking through on the provided link. Depending on the individual settings for the user's AKO account, the knowledge center will appear under their "My Workspace" tab on their personal AKO start page.

Future versions of the software should continue to leverage the contact list and software distribution capability in this resource.

Distribution List

NAME/AGENCY	ADDRESS	COPIES
Author(s)	Department of Systems Engineering Mahan Hall West Point, NY 10996	1
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14. ABSTRACT
This report provides details of the implementation of a forms assistance tool designed to help personnel charged with carrying out the United States Army's Casualty Assistance mission. The need for this tool has arisen with the expansion of casualty operations in the Global War on Terror (GWOT), the growing complexity of the system of benefits provided to the surviving family members of soldiers who are killed, and the high level of emphasis placed on executing this mission with compassion and precision.

The software tool, called the Armed Forces Casualty Readiness Enhancement System (AF-CARES 1.0), provides form filling assistance and access to case data in a stand alone application. The system uses a run time data representation of the case and an extensible markup language specification for the library of supported forms to automate the routing tasks common to every case of filling out a significant number of forms. The software automatically fills forms and provides access to the forms for viewing, printing, and editing. The software also provides a persistent save file format and case file reader for managing cases over time.

AF-CARES 1.0 has been deployed to all of the regional Casualty Assistance Centers (CACs) with 76 users participating in an Army Knowledge Online (AKO) knowledge center implemented to facilitate deployment, support, and the identification of capability gaps against an objective software assistance capability.

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